Nursing care of equine tracheostomy patients

Kayleigh Fagan BScVN RVN, Avenue Veterinary Hospital, shares insights into the equine tracheostomy procedure and the critical importance of post-operative monitoring and management of the patient

Occasionally, a horse's upper respiratory tract can be subjected to a blockage or obstruction which leads to acute respiratory distress.

A tracheostomy refers to a surgically created opening made into the front of the trachea, which usually includes the use of a tracheostomy tube to keep this opening patent. A 'tracheotomy' is the term used for the surgical procedure to create this opening. A temporary tracheostomy is when a tracheostomy tube is inserted usually just for a matter of days until it is no longer needed by the horse (Dixon, 1998). It is important that nurses and veterinary practitioners alike understand this procedure. In the case of an acute respiratory emergency, it can be life-saving. Close postoperative monitoring of these patients is extremely important, and it is vital for a veterinary nurse to know how to monitor and care for these tubes while they are in place.

INDICATIONS FOR TEMPORARY TRACHEOSTOMY IN EQUINE SURGERY

A temporary tracheostomy establishes an airway that bypasses the larynx and nasal passages (upper airway). It can provide a direct route for manual ventilation or inhalant anaesthesia. It may be performed either as an elective pre- or post-operative procedure, or as an emergency procedure in a life-threatening situation.

Emergency tracheostomy

The indication for an emergency tracheostomy is acute upper airway obstruction. Some conditions that are associated with acute upper airway obstruction include enlargement of the retropharyngeal lymph nodes (due to acute upper airway infections such as strangles), bilateral laryngeal paralysis and arytenoid chondritis. Sometimes, a difficult recovery from inhalant anaesthetic may indicate the need for a tracheostomy tube placement in order to aid breathing (Stephen, 2008).

The clinical signs of severe acute upper respiratory obstruction in a horse include flared nostrils, extended neck, cyanosis, sweating, laboured breathing with stridorous breathing noises at rest and increased costo-abdominal respiratory effort. If the last two signs in particular are present, a temporary tracheostomy is crucial (Dixon, 1988).

Elective tracheostomy

A tracheostomy may also be performed electively, typically either before or after a procedure of the upper respiratory tract. This usually involves surgery of the larynx or nasal passage(s) where respiratory obstruction is anticipated, for example, during debridement of necrotic laryngitis. It can also be used to permit inhalation anaesthesia during major upper respiratory surgery such as bilateral arytenoidectomy, where orotracheal intubation would prevent surgical access (Dallap Schael & Orsini, 2014). A tracheostomy can also be indicated prophylactically after postoperative bilateral nasal packing that is done to control haemorrhage (Dixon, 1988).

TRACHEOSTOMY PROCEDURE

Equipment:

- · Clippers with a number-40 blade;
- Gauze swabs soaked in 4% chlorhexidine scrub solution;
- Gauze swabs soaked in 70% isopropyl alcohol;
- 5-10ml of local anaesthetic solution;
- Sterile 10ml syringe;
- Sterile 20-21-gauge needle;
- Sterile gloves;
- Number-11 scalpel blade;
- Suitable tracheostomy tube see below; and
- Umbilical tape.

Optional:

- Twitch;
- Sedation; or

Size 0 non-absorbable suture on a straight needle.

A tracheostomy procedure is usually carried out with the horse conscious and standing but it can also be performed under general anaesthesia (Stephen, 2008). Whichever option is chosen depends on the situation. If the horse is standing, sedation may be applied. However, if an emergency arises where a horse is flailing around in acute respiratory distress, it is contraindicated to sedate them as attempting to do so is extremely dangerous. It is advised to wait until the horse loses consciousness and then immediately perform the procedure as quickly as possible (Dallap Schael & Orsini, 2014). Ideally, the area should be clipped and aseptically prepped, but this will likely not be possible in a life-threatening emergency. If the situation allows, it should be attempted to, even briefly, apply some antiseptic solution or 70% isopropyl alcohol (Stick, 2012). In this kind of emergency, any sharp object is used to penetrate the trachea and any tube available is used to establish an airway (Holtgrew-Bohling, 2016). In a non-life-threatening situation the area should be appropriately prepared with a sterile scrub and the surgical procedure carried out aseptically.

PROCEDURE

- The site for tracheotomy is first identified as the junction of the cranial and middle thirds of the ventral neck.
- Next, 5-10ml of local anaesthetic is injected into the skin and

CONTINUING EDUCATION I LARGE ANIMAL

subcutaneous tissue over the trachea.

- With sterile gloved hands, a 5-10cm incision should be made through the skin and subcutaneous tissue over the tracheal midline and running parallel to the length of it.
- The underlying paired sternothyrohyoideus muscles are bluntly dissected and retracted to reveal the tracheal cartilages.
- Two tracheal rings are then identified and the annular ligament between them is sharply incised in a direction parallel to the rings.
- This incision should be large enough to insert a tracheal tube but should not exceed 30% to 50% of the circumference of the trachea (Dallap Schael & Orsini, 2014).
- Two stay sutures can be applied at this point around the cranial and caudal tracheal rings in order to aid reinsertion of the tube after cleaning. These should be monofilament, non-absorbable sutures (Dixon, 1988).
- Finally, the tracheal tube of choice is then inserted through the incision and either sutured to the neck or secured using umbilical tape tied to the flanges of the tube and then around the back of the horse's neck. Ensure the tape is not too tight and possibly a cause of airway obstruction by checking if you can fit a few fingers underneath it (Dallap Schael & Orsini, 2014).

TRACHEOSTOMY TUBE TYPES

A variety of tracheostomy tubes are available for use in horses. Ideally, they should be made of non-irritating, autoclavable material, which is comfortable and easy to clean and maintain (O'Dwyer, 2014). Short-cuff silicone tubes are usually a better choice than stainless steel tubes as their compliance makes them more comfortable. Some tubes can also be self-retaining, these are popular as they do not need skin sutures for security. If a cuffed tube is being used, the cuff should not be inflated as it will cause mucosal erosions, especially if the tube is going to be in for a number of days. Instead, it should be tied or sutured in place using the flanges on either side of the tube (Stick, 2012).

 J-type for adult horses 12-25mm: Silicone, cuffed tube, fenestrated with bevelled tip. Easy inserted and secured with umbilical tape and sutures or tethered around the neck with umbilical tape. See Figure 1.



Figure 1: J-type tracheostomy tube in sterile packaging, ready for use.

- J-type for foals and miniature horses 5-10mm: Silicone, cuffed tube, unfenestrated with obturator for placement. Easily inserted and secured by tethering around the neck with umbilical tape.
- Metal J-type: Stainless steel tube that's uncuffed with a bevelled tip. Can be fenestrated or unfenestrated. Easily inserted and secured with umbilical tape and sutures or tethered around the neck with umbilical tape.
- Metal self-retaining: Involves two metal interlocking cannulas. Less easily inserted. Outer part with the latch is inserted with its tip pointing toward the lungs, then the inner part is inserted with its tip pointing toward the head. See Figure 2.



Figure 2: Self-retaining metal tracheostomy tube. The two parts displayed separately. Photo: Careena Laney, Weems and Stephens Equine Hospital, Texas, USA.

- Uncuffed silicone: Fenestrated, bevelled tip. Easy insertion, tube is secured with umbilical tape tied around neck.
- Human J-type: Disposable, can be cuffed or uncuffed, fenestrated or unfenestrated with outer and inner cannulas and obturator for placement. Used in miniature horses or foals, easy insertion, tethered round neck with umbilical tape (Mirza et al, 2018).

In an emergency, any type of tubing material is used as a tracheostomy tube (Stick, 2012). For example, this could be a segment of stomach tube, garden hose or the handle of five-litre container. See Figure 3.



Figure 3: Temporary equine tracheotomy tube from a five-litre container. Dotted arrows indicate the cut lines.

MANAGEMENT AND AFTERCARE

The post-operative management of tracheostomy tubes is extremely important and intensive. Proper care and monitoring of these tubes are vital in preventing complications such as blockages and infection. It is typically the role of the veterinary nurse to monitor and care for these patients while they are hospitalised.

When a tracheostomy tube is in place, the body treats it as a foreign body and produces excess secretions as part of a foreign body reaction. These secretions are what can cause blockages in the tube. For this reason, it is essential that the tube is cleaned or suctioned at least once or twice daily to remove the secretions. The procedure for cleaning the tube is discussed later.

The normal natural defence mechanisms of the upper airway such as filtration and humidification of inhaled air are bypassed in these patients. This makes them more susceptible to lower respiratory tract infections (Holtgrew-Bohling, 2016). This is another reason why cleaning of the tube and surrounding wound area is essential, along with keeping the horse in a clean environment. Depending on the animal's immune status and vaccination history, they may need to be given tetanus antitoxin. A broad-spectrum antibiotic may be prescribed along with a non-steroidal anti-inflammatory drug for pain relief (Dixon, 1988).

While these patients are hospitalised, they are best kept indoors in a box, which is free of fittings that they could potentially rub against resulting in dislodgement of the tube (Dixon, 1988). It is also important that they are kept in a relatively dust-free environment, as dust may enter the tube and irritate the respiratory tract. It is best to use dust-free shavings as bedding in the stable for this patient. As mentioned, the tracheostomy tube should be inspected frequently for proper positioning and possible obstruction by secretions. On the first day, the tube needs to be cleaned or replaced at least three to four times (Dixon, 1988). After the first day, the tube should be cleaned or replaced at least once or twice daily. This may need to be more often if the level of secretion production is high (Holtgrew-Bohling, 2016).

Some clinical signs that indicate the tube may be obstructed and requires cleaning include:

- Dyspnoea;
- Patient discomfort and distress;
- Coughing;
- Harsh sounds from the tracheostomy tube; and
- Discharge from the tracheostomy tube (O'Dwyer, 2014).

For replacement and cleaning of the tracheostomy tubes, it is a good idea to keep all supplies and equipment, including spare tubes, somewhere near the patient. This is both for convenience and in case it needs to be rapidly replaced for any reason. The procedure for removing and replacing the tube needs to be performed aseptically. You will need sterile gloves, new umbilical tape and a new sterile tube. Hands should be washed prior to the procedure and asepsis maintained throughout.

To replace the tracheostomy tube, first cut the umbilical tape (if present) and remove the current tube. Once the tube is removed, clean around the site with a sterile dilute antiseptic solution such as 0.1% povidone iodine and gauze swabs (Holtgrew-Bohling, 2016). While using the stay sutures to open up and widen the site, insert the new tube in a downward arc into the trachea. Thread the fresh umbilical tape through the flanges of the tube and either secure with sutures or tie it around the patient's neck. Lastly, petroleum jelly should be applied to the runoff area underneath the site to help prevent skin scald that can be caused by discharge from the wound (Holtgrew-Bohling, 2016). Care should be taken to avoid allowing any liquid or other material to enter the tracheal lumen.

The tracheostomy tube that was removed from the patient should be cleaned by soaking it in a disinfectant solution and using a wire bottle brush to effectively clean the lumen. Then, thoroughly rinse, dry, package it and sterilise it in the autoclave (metal tubes) or cold sterilisation (silicone tubes), leaving it ready for the next time the patient's tube needs replacing (Dixon, 1988).

REMOVAL AND HEALING

A temporary tracheostomy tube usually only needs to stay in place for a couple of days, until the obstruction is resolved, and the patient is able to breathe nasally on their own again. The method used to determine when the tube can be removed, is to temporarily block the lumen by hand and observe whether the horse can breathe without it (Munsterman, 2019). Once it is decided that the tube can be removed, the incision is left to heal by second intention. The site should be cleaned twice daily with a dilute antiseptic solution such as 0.1% povidone iodine as used previously, until it is fully healed (Stephen, 2008). Generally, the trachea will close in 10-14 days and then heal completely in three weeks (Munsterman, 2019). During the healing of the tracheostomy site the patient should still be monitored closely. A tube should be left available in case the horse becomes dyspnoeic and the tube needs to be reinserted (Mirza et al, 2018).

COMPLICATIONS

One of the most likely complications of tracheostomy is wound infection, particularly if sterile technique is not used. When a tracheostomy tube is in place, the airway is now open to the environment and can become easily contaminated. Occasionally, subcutaneous emphysema (trapped air) can occur if air is able to move around the outside of the tube. This usually appears adjacent to the tracheostomy site and gives rise to crepitant subcutaneous swelling with a characteristic 'bubble wrap' texture (Holtgrew-Bohling, 2016). However, no treatment exists, and the body just gradually reabsorbs the subcutaneous air in the majority of cases (Dallap Schael & Orsini, 2014), although occasional complications, including pneumothorax, have been reported (Kelly et al, 2003). More commonly, obstruction of the tracheal tube with mucus can occur. This can happen if the patient isn't closely monitored and the tube regularly cleaned (Stick, 2012). Ischaemic necrosis of the tracheal mucosa can be likely if a cuffed tube is used and overinflated. The cuff should not be inflated unless the horse is to be ventilated (Munsterman, 2019).

Long-term complications of tracheostomy are usually rare but can include tracheal stricture and damage to the tracheal rings. Tracheal stricture is possible as the tracheal mucosa contracts during healing. Granulation tissue that is produced in the lumen can also contribute to this if it excessive. If the tracheal rings are damaged this can cause cartilaginous deformity which also contributes to luminal narrowing (Dallap Schael & Orsini, 2014). Long-term complications can be reduced by removing the tube as soon as possible (Stick, 2012).

CONCLUSION

In conclusion, the care of a tracheostomy tube can be a very intensive process and requires attentive care by experienced personnel. In an equine hospital, the person most likely to be carrying out this care is a veterinary nurse.

When a horse has a tracheostomy tube in place, they are extremely vulnerable to respiratory infection. Minimising contamination of the respiratory tract should be a top priority of a veterinary nurse dealing with these patients. Failure to look after these tubes correctly can cause blockage and infection of the trachea, which can lead to further respiratory compromise and lower respiratory tract infection. Both of these conditions could have devastating consequences for the horse. This is where regular cleaning and replacing of the tube is vital and something a veterinary nurse in equine practice must be able to carry out.

It is important that each patient is treated as an individual as the frequency of cleaning of the tube depends on the amount of secretions produced. Knowing how to look after these patients properly and treating each as an individual is essential in providing excellent patient care.

ACKNOWLEDGEMENTS

Thanks to Sinead Devine and Careena Laney for assistance with the illustrations.

REFERENCES

- Dallap Schaer B and Orsini JA. (2014). Respiratory System. In: Orsini, J.A. and Divers, T.J., eds. Equine Emergencies: Treatment and Procedures. 4th ed. St. Louis: Elsevier Inc., pp.450-484.
- Dixon P. (1988). Tracheostomy in the horse. In Practice, 10(6), pp. 249-253.
- Holtgrew-Bohling K. (2016). Equine Surgical Procedures. In: Holtgrew-Bohling, K., ed. Large Animal Clinical Procedures for Veterinary Technicians. 3rd ed. St. Louis: Elsevier Inc., pp.347-373.
- Kelly G, Prendergast M, Skelly C, Pollock PJ, Dunne K. (2003). Pneumothorax in a horse as a complication of tracheotomy. Irish Veterinary Journal, 56(3), pp.153-156.
- Mirza MH, Johnson JR and Costa LRR. (2018). Tracheostomy. In: Costa, L.R.R. and Paradis, M., eds. Manual of Clinical Procedures in the Horse. 2nd ed. Hoboken: John Wiley and Sons, Inc., pp.216-225.
- Munsterman AS. (2019). Equine Emergency Procedures [online]. Available from: https://www.msdvetmanual.com/ emergency-medicine-and-critical-care/equine-emergencymedicine/equine-emergency-procedures?query=equine%20 tracheostomy [accessed 16 March 2019].
- O'Dwyer L. (2014). Tracheostomy tube maintenance and care. Veterinary Nursing Journal, 23(9), pp.23-25.
- Stephen J. (2008). Procedures in the adult horse. In: Corley, K. and Stephen, J., eds. The Equine Hospital Manual. 2nd ed. Oxford: Wiley-Blackwell., pp.3-120.
- Stick J. (2012). Trachea. In: Auer, J. and Stick, J., eds. Equine Surgery. 4th ed. St. Louis: Elsevier Inc., pp.643-649.

READER QUESTIONS AND ANSWERS

1. HOW LONG IS A TEMPORARY TRACHEOSTOMY TUBE USUALLY KEPT IN FOR?

- A. Up to a few days
- B. One week
- C. One month
- D. A few months
- 2. IF A HORSE IS IN ACUTE RESPIRATORY DISTRESS YOU SHOULD TRY YOUR BEST TO JUMP IN AND SEDATE THEM?
 - A. True
 - B. False

3. WHERE IS IT BEST TO KEEP THESE PATIENTS?

- A. In a stable
- **B.** Turned out in a paddock
- **c.** Turned out in a sand arena
- D. In a barn with other horses

- 4. WHICH METHOD IS USED TO DETERMINE WHEN THE TUBE CAN BE REMOVED?
 - A. Take out the tube and see if horse can breathe without it
 - B. Once you notice an excessive build-up of dirt and mucus
 - **c.** Temporarily block the lumen of the tube and see if the horse can breathe nasally
 - D. Once it has been a few days since placement of the tube

5. BY WHAT METHOD DOES THE WOUND LEFT BY A TRACHEOSTOMY TUBE HEAL?

- A. Primary closure
- B. Delayed primary closure
- **C.** Secondary closure
- D. Secondary intention

ANSWERS: 1:A; 2:B; 3:A; 4:C; 5:D.